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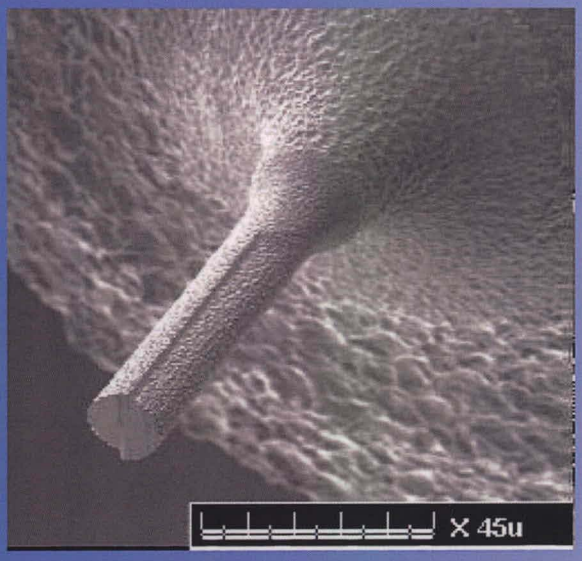

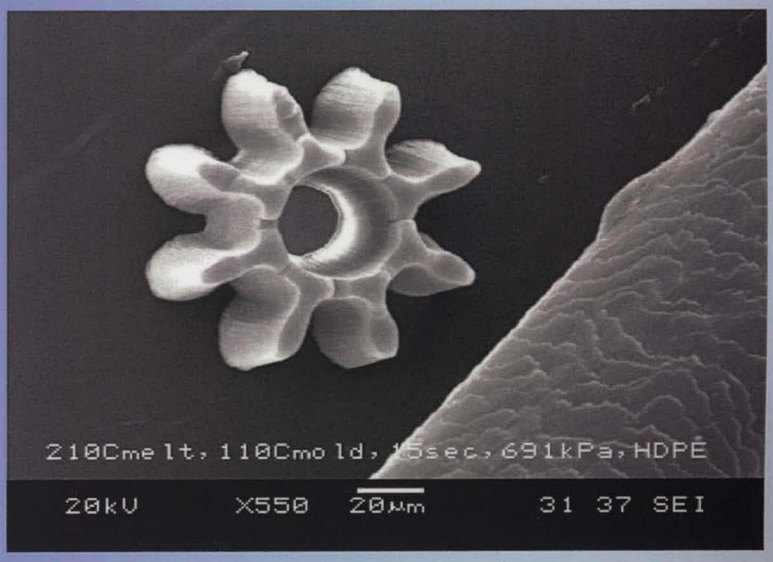

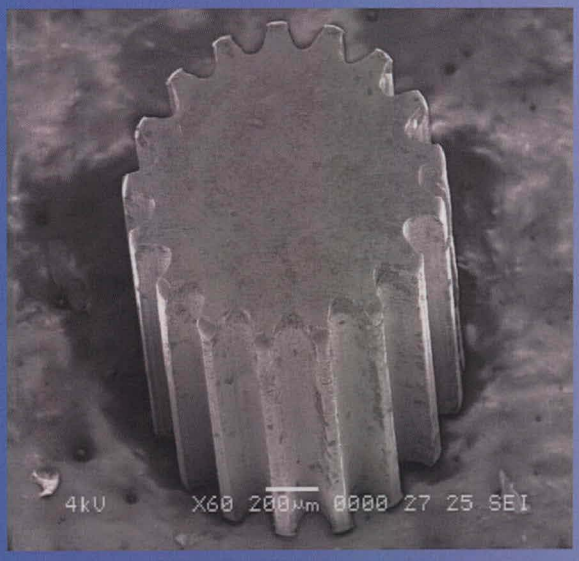

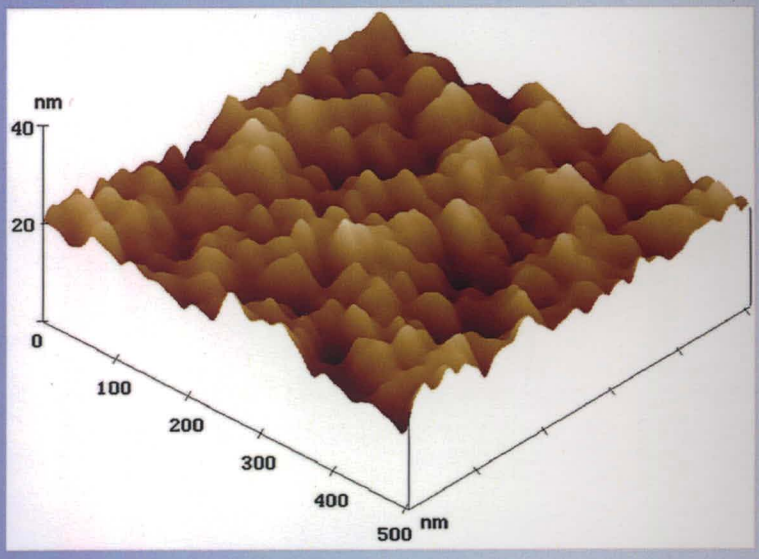

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Micro Electro Discharge Machining of Micro Pillar Array: Analysis of Surface Finish

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Abstract. This chapter discusses the investigation the optimization of machining parameters for machining channel in die sinking micro-EDM. The aim is to lowest surface roughness (Ra). The work material was Ti-6Al-4V machined with tungsten carbide electrode by varying three machining parameters; powder concentration, energy and feed rate. By using 2^3 full factorial design of experiment, eight experiments were conducted. Data were analyzed by Design Expert software. The lowest surface roughness Ra is found to be 1.04 μm with powder concentration is 15.00 g/L, energy of 451.25 μJ and feed rate of 8 μm/s.

Results and Discussions

This chapter presents the experimental results on micro die sinking EDM of Ti-6Al-4V. SiC powder at concentration 0 g/L and 15 g/L was investigated for this experiments. Analysis and discussion are made on the MRR and surface roughness (R_a). The results are extracted based on the variation of machining parameters given in Table 3.4. The experimental plans for micro die sinking EDM process were based on the Full Factorial design. The experimental results are reported and analyzed. ANOVA was used to analyze the optimization parameters of surface roughness (Ra) and Material Removal Rate (MRR) in order to fabricate micro pillar array. In this project, we analyzed the effect of powder in micro electro discharge milling on R_a and MRR but only the surface roughness will be discuss and conclude in this report. The parameters using are the concentration of powder Silicon Carbide (g/L), the energy (μJ) and feed rate (μm). Optimization of the process is concerning with minimizing of R_a and maximizing MRR.

Experimental Results

The experimental plans and results are presented in this section. The experimental of micro die sinking EDM of Ti-6Al-4V involved 3 factors which were varied at two levels; which are high and low levels. The factors were powder concentration, energy and feed rate. They are labelled A, B and C respectively. The details of the factors are given in Table 3.5. The machining responses that were investigated were MRR and R_a. The micro die sinking EDM process was investigated using one full factorial design. This design is used to identify the significant factors that affect the machining responses. Design expert software version 8 was employed and the experimental results are given in Table 1.

The results from the Table 1 were then placed into the Design Expert software for further analysis. Without performing any transformation on the responses, the revealed design status was evaluated, and all the information was used for further analysis, following the steps